A device helping learners to self-assess themselves

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A DEVICE HELPING LEARNERS TO SELF-ASSESS THEMSELVES

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KEYWORDS: self-assessment, tools for teachers, tools for learners

Abstract

In this paper, we introduce the architecture of an environment, which aims at helping learners in their self-assessment process. We show how we integrated three systems to build an experimental device based on this architecture. We then present the experiment we conducted to show the utility of this device and also to validate our hypothesis that it is easier for learners to self-assess themselves from an exercises-point of view than from a knowledge-point of view.

INTRODUCTION

The aim of this paper[1] is to describe an environment helping learners to self-assess themselves. This environment, implemented for 9 years old pupils in mathematics, could be used for various disciplines or subjects and for learners of various school-levels.

By studying learners' behaviour, we noticed that learners, especially low-level ones, encounter difficulties in self-assessing themselves from a knowledge-point of view. We state that it could be easier for learners to self-assess themselves from an exercises-point of view than from a knowledge-point of view. By exercises-point of view self-assessment, we mean a set of self-assessment questions concerning what the learner manages to do in the exercises. For example, "I manage to replace the weight of the crocodiles by the corresponding weight in cats" is a self-assessment criterion from an exercises-point of view for the exercise used in our experiment. This problem aims at calculating the Eiffel tower's weight in cats given equivalences between a cat's weight and other animals' weight. The learner evaluates himself after comparing the solutions he proposed to the exercises, with the correct answers. By knowledge-point of view self-assessment, we mean a set of self-assessment questions concerning knowledge (for example "I know the technique of multiplication for decimal numbers"). In that second case, the link between the exercises and the self-assessment content is not obvious for most of learners.

In order to prove the feasibility and the interest of such an environment, we designed an experimental device aiming at helping the learner in his self-assessment process by proposing him a tool linking the two kinds of self-assessments.

In this paper, we first describe the device's architecture from his actors' point of view; we then present the environment's architecture. At last, we present the experimentation of the device and draw our conclusions.

[1] The work presented here is the result from a research conducted cooperatively between CLIPS-IMAG and LIRIS, involving in particular C. Eyssautier, S. Jean-Daubias and J.-P. David [BAVAY-EYSSAUTIER 03].

DEVICE'S ARCHITECTURE

The experimental device comprises several steps (cf. Figure 1).

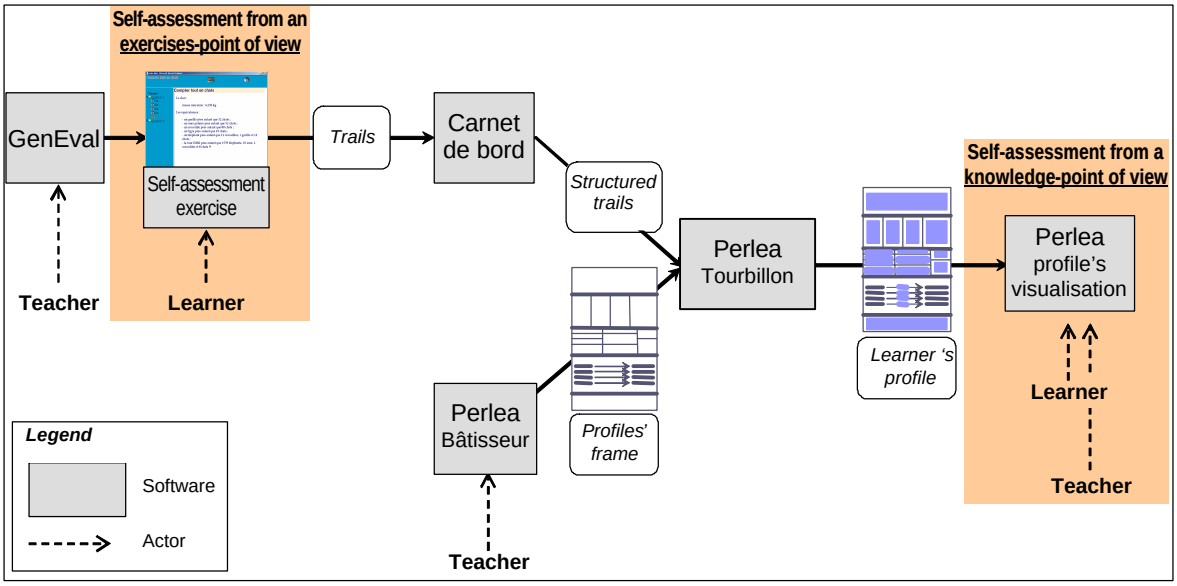

Figure 1: Device's architecture.

Creation of the self-assessment exercise by the teacher: Through GenEval authoring tool, the teacher can create self-assessment exercises by defining the wording of the exercise, questions, helps, answers and self-assessment criterions from an exercises-point of view.

Carrying of the self-assessment exercise by the learner: The learner does the exercise, compares his answer to the answer proposed in the system and self-assesses himself, for each self-assessment criterions from an exercises-point of view. GenEval then saves the marks corresponding to the self-assessment criterions.

Structuring of learner's data: Carnet de bord then restructures GenEval data in a tree diagram in order to make it usable by other systems.

Creation of the profile's frame by the teacher: The teacher describes through PERLEA-Bâtisseur the profile suited to the knowledge linked to the exercise: we call this description "profile's frame".

Filling of the profile's frame by the system: After the creation of the profile's frame by the teacher, PERLEA-Tourbillon automatically fills the profile's frame with each learner's data. Therefore, after this step, there is one profile per learner: students' profiles are instantiations of the profile's frame. Only the data contained in these profiles differ for each learner, the structure -the profile's frame- is the same. These data are the learner's name, his identification number and his self-assessment marks for each criterion. Tourbillon turns the learner's self-assessment from an exercises-point of view into a self-assessment from a knowledge-point of view. Indeed, the teacher has defined the profile's frame from a knowledge-point of view, whereas Carnet de bord's data are from an exercises-point of view.

Profile's presentation to the learner and negotiation between learner and teacher: It is interesting to show learners' profiles not only to teachers, but also to learners themselves [Kay 1999] [Pain et al. 1996]. In our device, learners self-assess themselves from an exercises-point of view, what we suppose to be easier to do for them. Profiles we present them at this step are profiles from a knowledge-point of view. It is interesting to know if the learner recognises himself in this assessment and to show him the link with his self-assessment from an exercises-point of view, then to eventually negotiate his profile. As shown by [Bull and Pain 1995],

negotiation of the profile content with the teacher can help the learner in his thought on his knowledge state. Indeed, this step permits the learner to explain what he thinks he knows or not, and to negotiate his profile with regard to the self-assessment exercise and more generally with regard to his knowledge state.

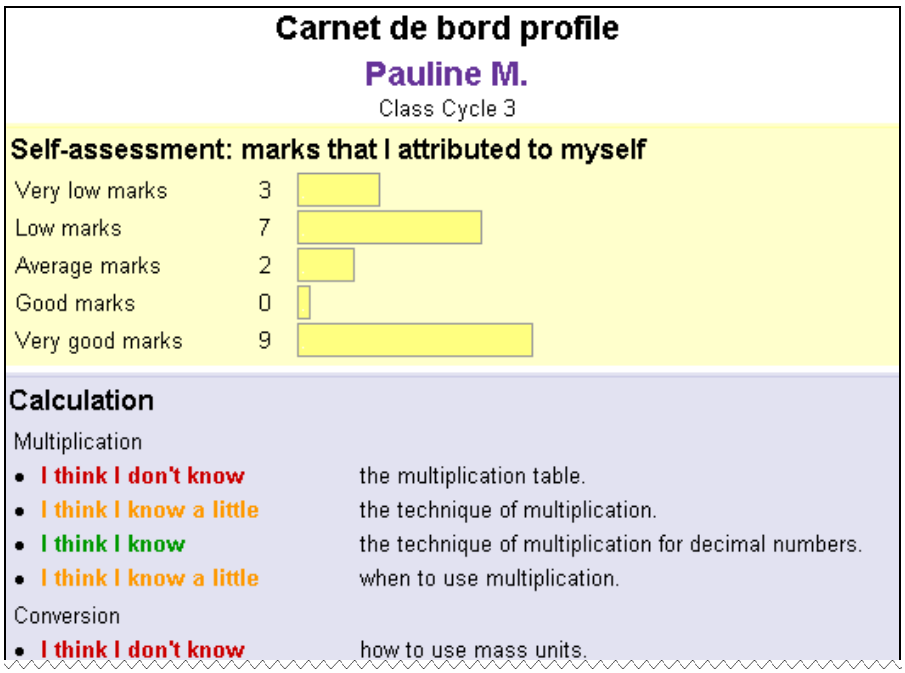

Figure 2: PERLEA: an extract of profile's presentation to the learner.

ENVIRONMENT'S ARCHITECTURE

In the preceding part, we described the device we propose to help learners to self-assess themselves. In this part, we present how we used different systems to conceive this device. We begin with PERLEA, which manage the profiles in the device. We then show how GenEval and Carnet de bord are integrated in PERLEA architecture.

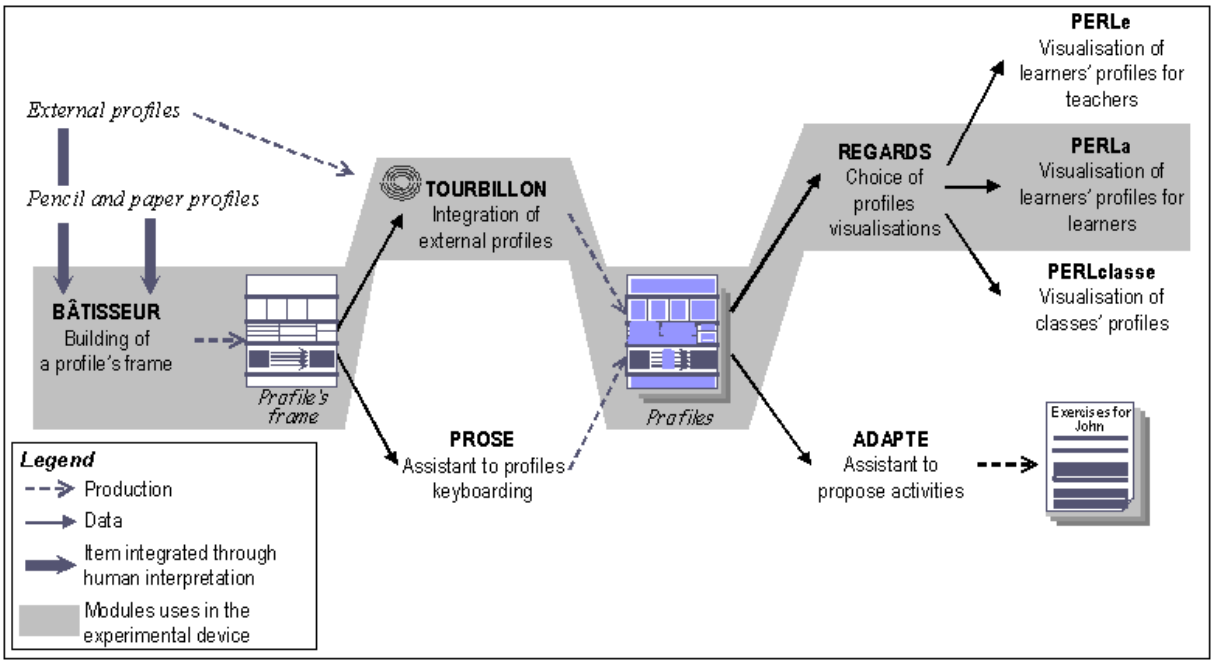

Figure 3: PERLEA's architecture.

PERLEA research project aims at studying learners' profiles and their roles in teachers work [Jean-Daubias 2003]. Through PERLEA, we would like to propose to teachers a system helping them to manage learners' profiles. These profiles can result from Interactive Learning Environments (external profiles) or from paper-pencil work.

PERLEA comprises five main parts:
– The first module is Bâtisseur (*Builder*). It allows teachers to describe the profile's frame corresponding to the profiles he wants to use. In this purpose, the teacher has moulds of brick, corresponding to different ways to present students' knowledge in profiles. These patterns constitute PERLEA's description language of profiles. The set of bricks built by the teacher constitutes the profile's frame.
– The teacher has then to complete the profile's frame to constitute the learners' profiles. In case of learners' profiles resulting from external softwares, PERLEA includes Tourbillon (*Whirl*) programs to convert profiles. For each external software, a suitable Tourbillon has to be created by computer scientists. In case of paper-pencil learners' profiles, PERLEA-Prose helps the teacher to keyboard his learners' profiles according to the profile's frame defined through Bâtisseur. After this step, the teacher has one profile per learner.
– In PERLEA-Regards (*Views*), the teacher defines the visualisation proposed in the PERL modules: for example, he can choose to show the full profile or a part of it to the learner, in a textual or a graphical way.
– PERL modules propose to the actors of the learning (mainly teachers and learners) an interactive display of learners' profiles. The profile displayed for the learner himself allows him to be actor of his learning and to think about his knowledge state. The class's profile should give an overview of the learners of the class's knowledge.
– Finally, PERLEA-Adapte (*Suited*) could help the teacher to propose to the learner or to a group of learners of similar profiles, exercises suitable to their profiles.

As for Carnet de bord (*Logbook*) [Vallon 2002], it allows to save, structure and represent learners' data from a GenEval self-assessment exercise [Cogne et al. 1998]. It generates a particular learner's profile, made up of the time spent on the questions and of the learner's marks to self-assessment criterions. In our device, we separate the saving and structuring step and the representation step of Carnet de bord. Indeed, the representation step of the learner's profile is delegated to PERLEA in our device.
From PERLEA's point of view, Carnet de bord is an external software that produces profiles to be integrated. From this perspective, Carnet de bord integrates with PERLEA's architecture as profiles' supplier, when the GenEval environment appears upstream of this architecture.

EXPERIMENTATION

We presented here the device we designed to help learners in their self-assessment, with the aim of testing our hypothesis that it is easier for learners to self-assess themselves from an exercises-point of view than from a knowledge-point of view. With the experiment presented in this part, we want also to test the utility of our device: is it helpful for a learner engaged in a self-assessment process?

The experiment took place in June 2003 in two classrooms with 32 9 or 10 years-old subjects during one day and a half. Teachers of these classes are use to propose self-assessment tasks to their pupils both from an exercises-point of view and from a knowledge-point of view. According to the information given by the teachers, we defined three groups of learners

depending on their level for the proposed exercise: low, average and high mastery. The chosen mathematical exercise is the unit conversion problem presented in the introduction.
The experiment consisted in two parts: the pre-test and the experiment itself (cf. Figure 4). The pre-test is a pencil and paper self-assessment test from a knowledge-point of view, which constitutes our comparison data. The experiment as such consists in two steps. Firstly, the learner does the exercise, compares his solution to the correct answer and self-assesses himself from an exercises-point of view. Secondly, PERLEA presents his self-assessment from a knowledge-point of view to the learner. The teacher and the learner negotiate it, in particular by comparing both self-assessments from a knowledge-point of view: the pre-test's one and the device's one, in order to encourage learners to think about the quality of their self-assessment. Between both steps of the experiment, the device converts the self-assessment from an exercises-point of view to a knowledge-point of view.

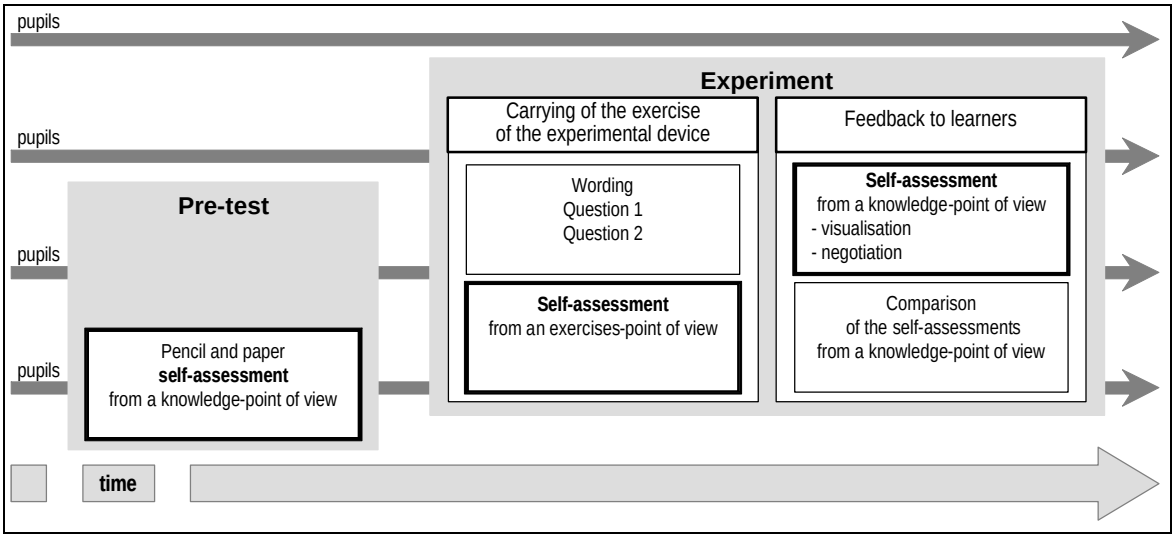

Figure 4: Experimentation procedure of the device.

Our experiment data consists in all files and sheets of self-assessments, learners' notes and experimenters' notes. We analyse it from four points of views, taking also into account teachers' opinion. We study: the negotiation between learner and teacher ; the pertinence of the pre-test's self-assessments from a knowledge-point of view ; the pertinence of the device's self-assessments from an exercises-point of view ; the distance, for each learner, between the self-assessments from a knowledge-point of view obtained with the pre-test and with help from the device, from one hand depending on the group level, on the other hand depending on the pertinence of the device's self-assessments from an exercises-point of view.

The results we obtain are interesting. First of all, the pre-test confirms our observation that low-level pupils encounter difficulties in self-assessing themselves from a knowledge-point of view. Furthermore, our hypothesis has been validated: it is easier for learners to evaluate themselves from an exercises-point of view than from a knowledge-point of view. As regards the utility of our device, results are also positives: the device his helpful for learners, especially for low-level ones who are actor of their learning. However, as we expected it, the experiment shows us as well that, in order to be effective, the device requires that the learner knows a bit how to self-assess himself from an exercises-point of view. Finally, by facilitating comparison between different self-assessments, the place given to negotiation permits to promote learners' reflection on their knowledge.

CONCLUSION

In this paper, we introduced the architecture of an environment, which aims at helping learners in their self-assessment process. We shown the way we integrated three systems to build an experimental device based on this architecture. We then presented the experiment we conducted to show the utility of the device and to validate our hypothesis that it is easier for learners to self-assess themselves from an exercises-point of view than from a knowledge-point of view.
Our experiment shown that our device is useful for learners, especially for low or average-level learners who are actors in their learning. This device must be seen as a temporary tool helping learners to go from self-assessment from an exercises-point of view to self-assessment from a knowledge-point of view.
This work also confirms the major interest of negotiation in learning. That confirms our intention to grant a significant place to negotiation between learners and teachers in PERLEA.

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